Stoller
Hanford Office

DOE-EM/GJ667-2004

# 299-W22-13 (A7838)
## Log Data Report

## Borehole Information:

| Borehole: 299-W22-13 (A7838) | | | Site: 216-S-7 Crib | | |
|---|---|---|---|---|---|
| Coordinates (WA St Plane) | | GWL[1] (ft) : None | | GWL Date: 05/10/04 | |
| North | East | Drill Date | TOC[2] Elevation (ft) | Total Depth (ft) | Type |
| 134172.135 m | 567142.834 m | 03/56 | 681.68 | 345 | Cable |

## Casing Information:

| Casing Type | Stickup (ft) | Outer Diameter (in.) | Inside Diameter (in.) | Thickness (in.) | Top (ft) | Bottom (ft) |
|---|---|---|---|---|---|---|
| Welded steel | 2.5 | 8 5/8 | 8 | 5/16 | + 2.5 | 345 |
| Welded Steel | 0 | 4.5 | 4 | 0.25 | 0 | 194.5 |

## Borehole Notes:

The logging engineer used a caliper to determine the 8-in. outside casing diameter. The caliper and casing stickup were both measured using a steel tape. Inside casing diameter was measured with a steel tape. All measurements were rounded to the nearest 1/16 in. Total depth (345 ft) of the casing is derived from Ledgerwood (1993). It is reported in Ledgerwood (1993) that a cement plug was placed at 219.5 ft. A 4-in. liner was placed to a packer at 194.5 ft. Sand was placed on top of the packer. Grout was emplaced between the 4-and 8-in. annular space from the ground surface to the sand. Total logging depth was 219 ft. The logging engineer measured the depth to water. Coordinates and top of casing (TOC) elevation are derived from HWIS[3]. Logging data acquisition is referenced to the TOC.

## Logging Equipment Information:

| Logging System: | Gamma 1G | | Type: | SGLS (35%)<br>SN: 34TP10967A |
|---|---|---|---|---|
| Calibration Date: | 01/04 | Calibration Reference: | GJO-2004-597-TAC | |
| | | Logging Procedure: | MAC-HGLP 1.6.5, Rev. 0 | |

## Spectral Gamma Logging System (SGLS) Log Run Information:

| Log Run | 1 | 2 | 3 | 4 Repeat | |
|---|---|---|---|---|---|
| Date | 05/06/04 | 05/10/04 | 05/11/04 | 05/12/04 | |
| Logging Engineer | Spatz | Spatz | Spatz | Spatz | |
| Start Depth (ft) | 25.0 | 219.0 | 121.0 | 25.0 | |
| Finish Depth (ft) | 3.0 | 120.0 | 24.0 | 3.0 | |
| Count Time (sec) | 200 | 200 | 200 | 200 | |
| Live/Real | R | R | R | R | |
| Shield (Y/N) | N | N | N | N | |
| MSA Interval (ft) | 1.0 | 1.0 | 1.0 | 1.0 | |

| Log Run | 1 | 2 | 3 | 4 Repeat | |
|---|---|---|---|---|---|
| ft/min | N/A[4] | N/A | N/A | N/A | |
| Pre-Verification | AG081CAB | AG083CAB | AG084CAB | AG085CAB | |
| Start File | AG082000 | AG083000 | AG084000 | AG085000 | |
| Finish File | AG082022 | AG083099 | AG084097 | AG085022 | |
| Post-Verification | AG082CAA | AG083CAA | AG084CAA | AG085CAA | |
| Depth Return Error (in.) | None | -1 | -1 | None | |
| Comments | No fine-gain adjustment. | No fine-gain adjustment. | No fine-gain adjustment. | No fine-gain adjustment. | |

## Logging Operation Notes:

Logging was conducted without a centralizer on the sonde and measurements are referenced to TOC. A repeat section was collected in this borehole to evaluate system performance.

## Analysis Notes:

| Analyst: | Henwood | Date: | 05/18/04 | Reference: | GJO-HGLP 1.6.3, Rev. 0 |
|---|---|---|---|---|---|

Pre-run and post-run verifications for the logging system were performed before and after each day's data acquisition. The acceptance criteria were met.

A combined casing correction for the 8- and 4-in. casings of 0.5625 in. (0.3125 + 0.25) was applied to a depth of 194.5 ft. A correction for 0.3125-in.-thick casing was applied from 194.5 ft to total depth of the borehole (219 ft).

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1GJan04.xls using an efficiency function determined from annual calibrations. Dead time corrections are applied where it exceeds 10.5 percent. No water corrections were necessary.

## Log Plot Notes:

Separate log plots are provided for the man-made radionuclides ($^{137}$Cs, $^{60}$Co, and $^{238}$U) detected in the borehole, naturally occurring radionuclides ($^{40}$K, $^{238}$U, $^{232}$Th [KUT]), a combination of man-made, KUT, and dead time, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. A repeat log section is also included.

## Results and Interpretations:

$^{137}$Cs, $^{60}$Co, and $^{238}$U were the man-made radionuclides detected in this borehole. $^{137}$Cs was detected between 20 and 82 ft and at a few sporadic locations in the borehole near its MDL of approximately 0.2 pCi/g. The maximum concentration was measured at approximately 62 pCi/g at 37 ft.

$^{60}$Co was detected near its MDL of 0.05 pCi/g at depths of 42 to 44 ft.

Processed uranium ($^{234}$Pa at 1001 keV) was detected at sporadic locations between 54 and 72 ft. The maximum concentration was 15 pCi/g at 66 ft.

Historical gross gamma logs (Fecht et al. 1977) indicate gamma activity above background levels between approximately 5 and 88 meters (16-289 ft) in 1963. Significant decay had occurred by 1976. On the basis of the current SGLS log data, this activity can be attributed, at least in part, to the above mentioned radionuclides.

Elevated radon existed in the borehole during log runs 2 and 3. The repeat section indicated good agreement of the naturally occurring KUT.

## References:

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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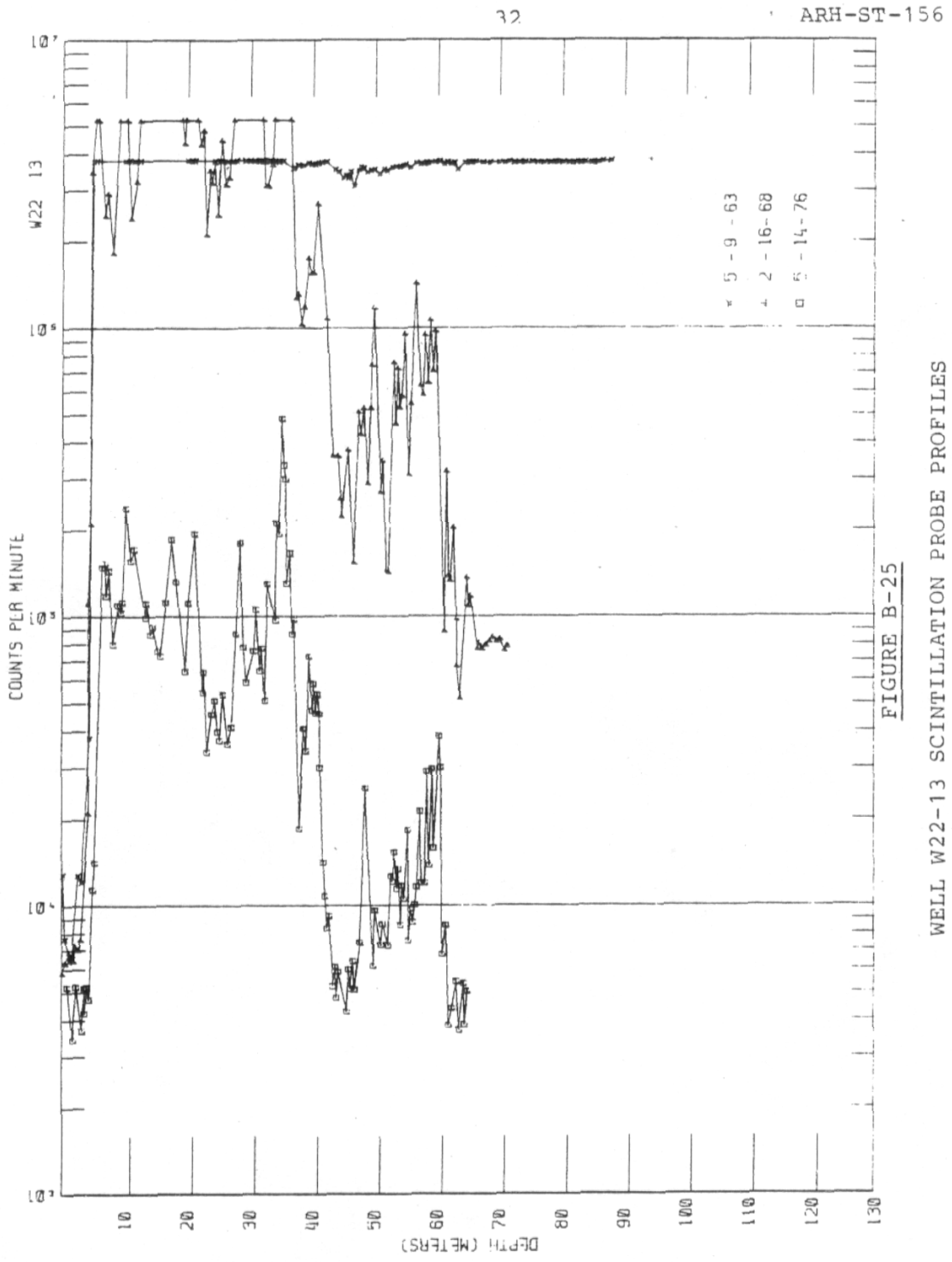
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable




from Fecht et al. (1977)

*Scintillation Probe Profiles for Borehole 299-W22-13, Logged on 5/9/63, 2/16/68, and 5/14/76*

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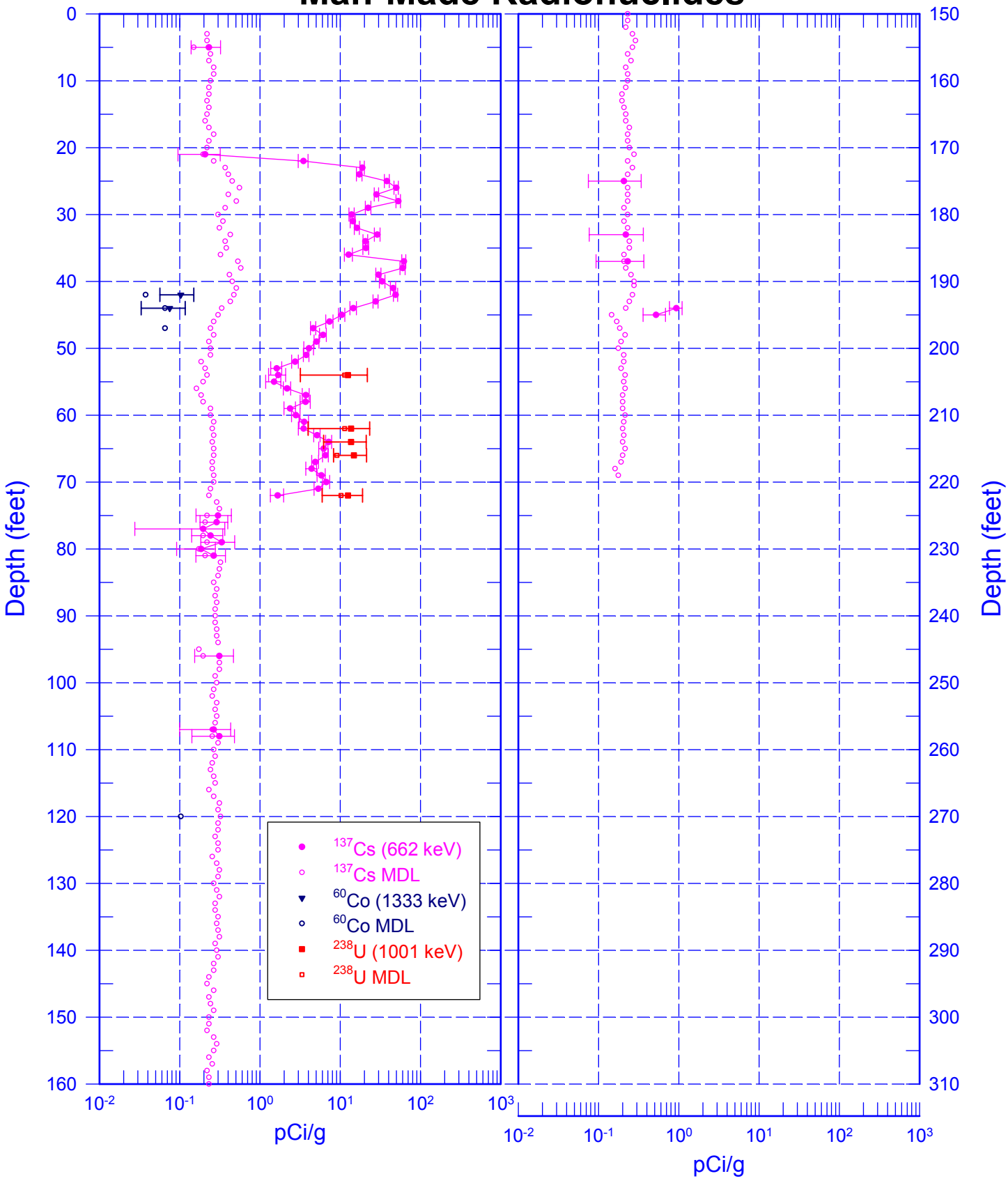
## Man-Made Radionuclides




Zero Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Log Date - 05/06/04

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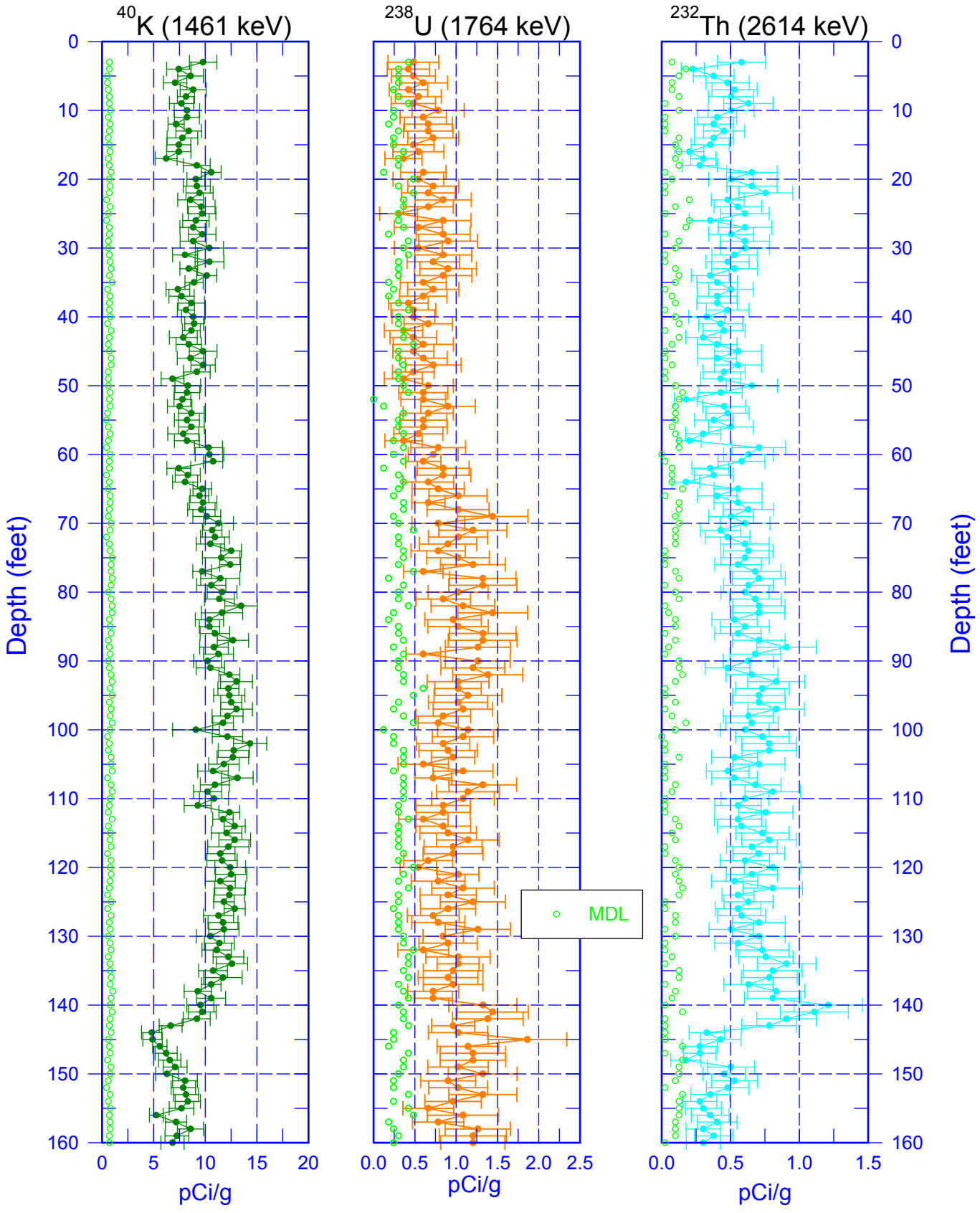
## Natural Gamma Logs

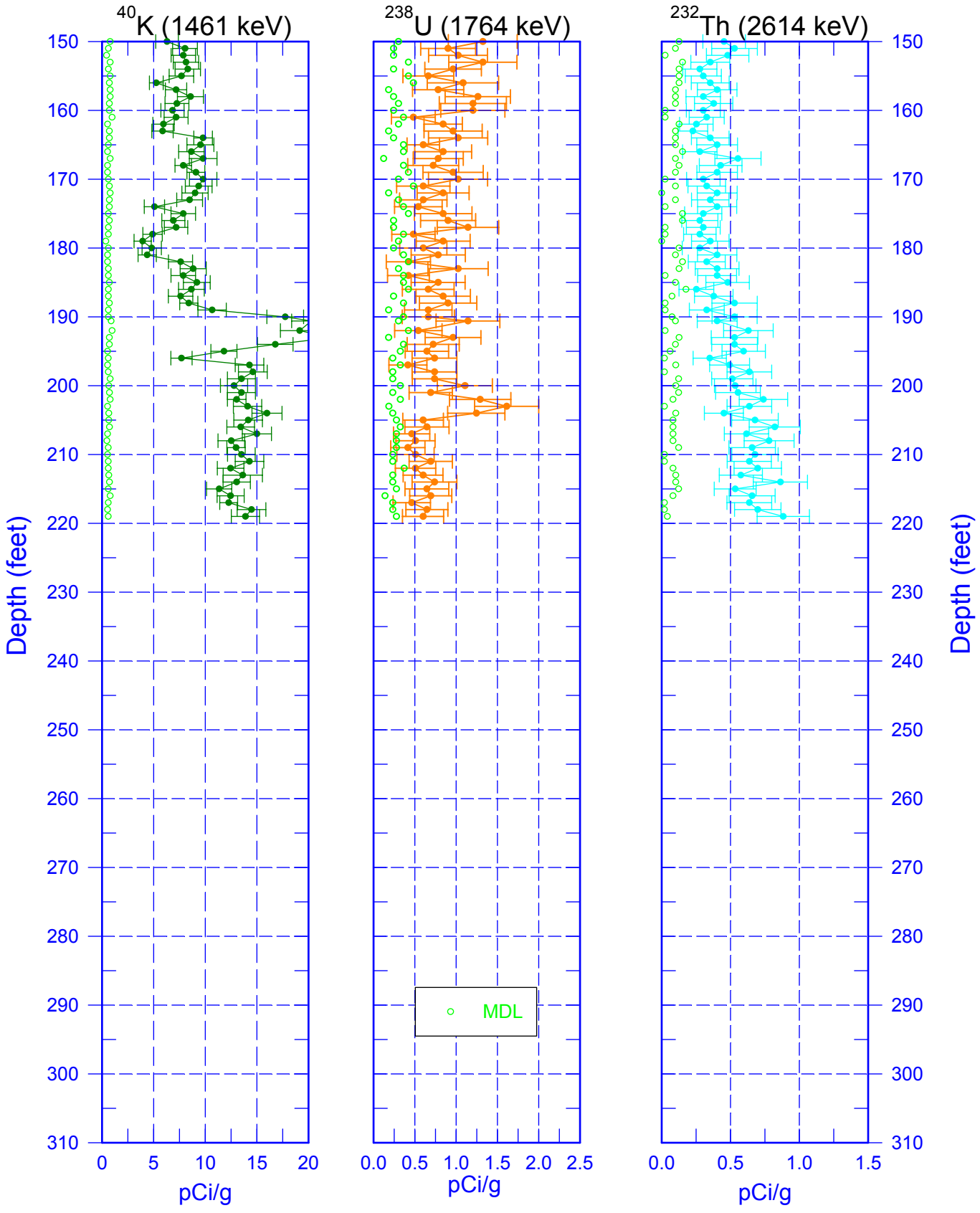



Zero Reference = Top of Casing

Depth scale: 1" = 20 ft

Last Log Date - 05/12/04

# 299-W22-13 (A7838)
## Natural Gamma Logs

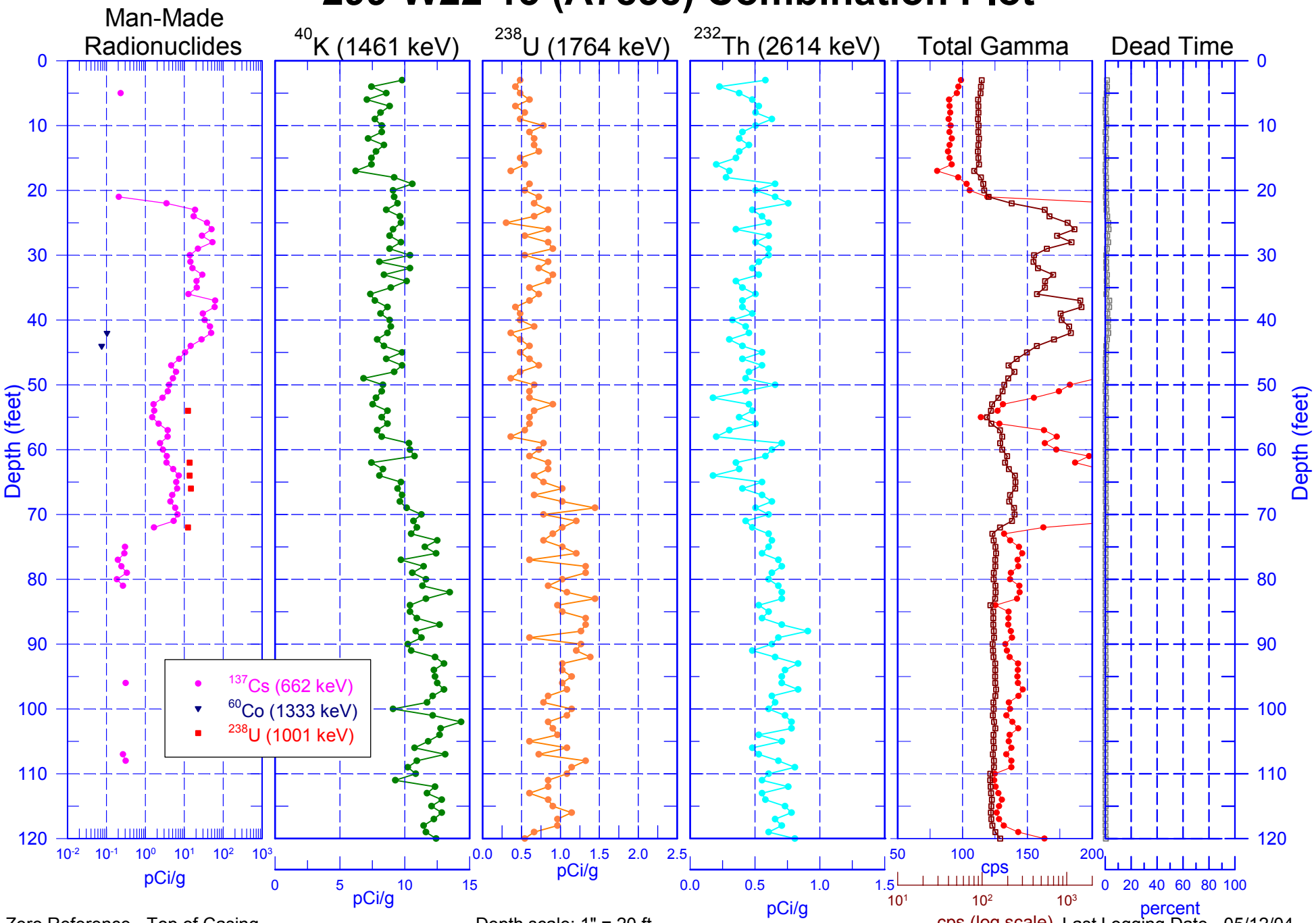



Zero Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Log Date - 05/12/04

# 299-W22-13 (A7838) Combination Plot

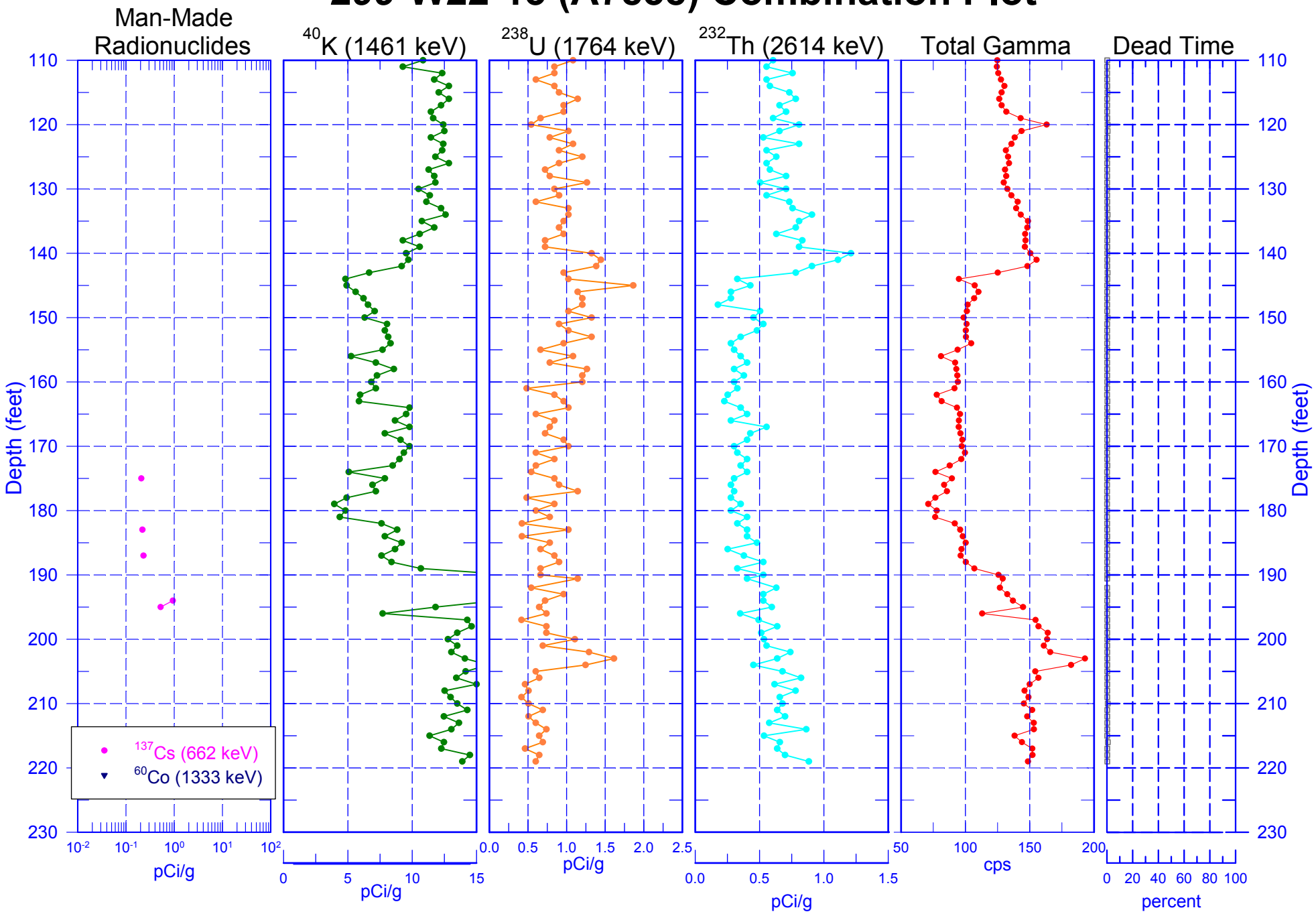



Zero Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Logging Date - 05/12/04

# 299-W22-13 (A7838) Combination Plot

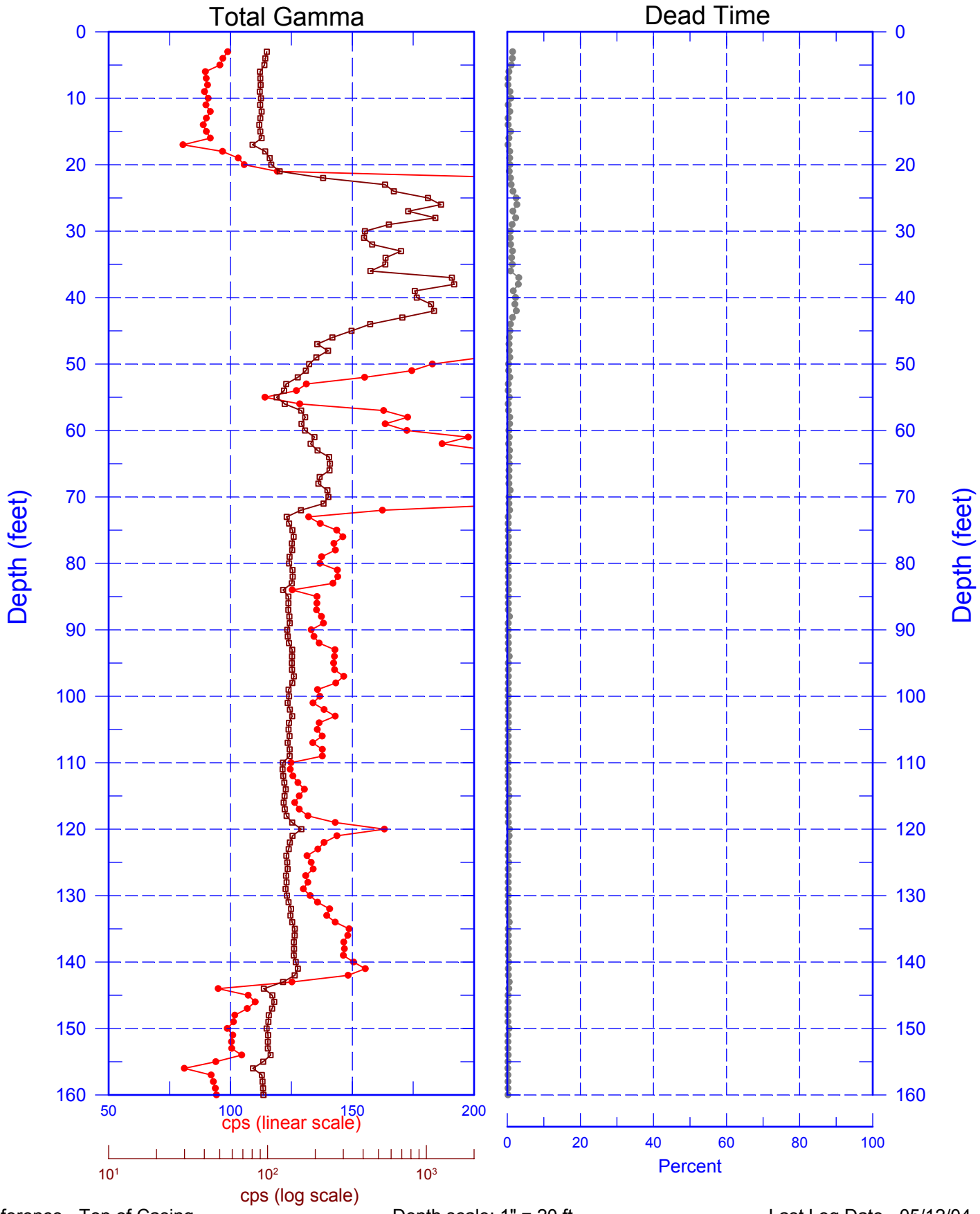



Zero Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Logging Date - 05/12/04

# 299-W22-13 (A7838)
# Total Gamma & Dead Time

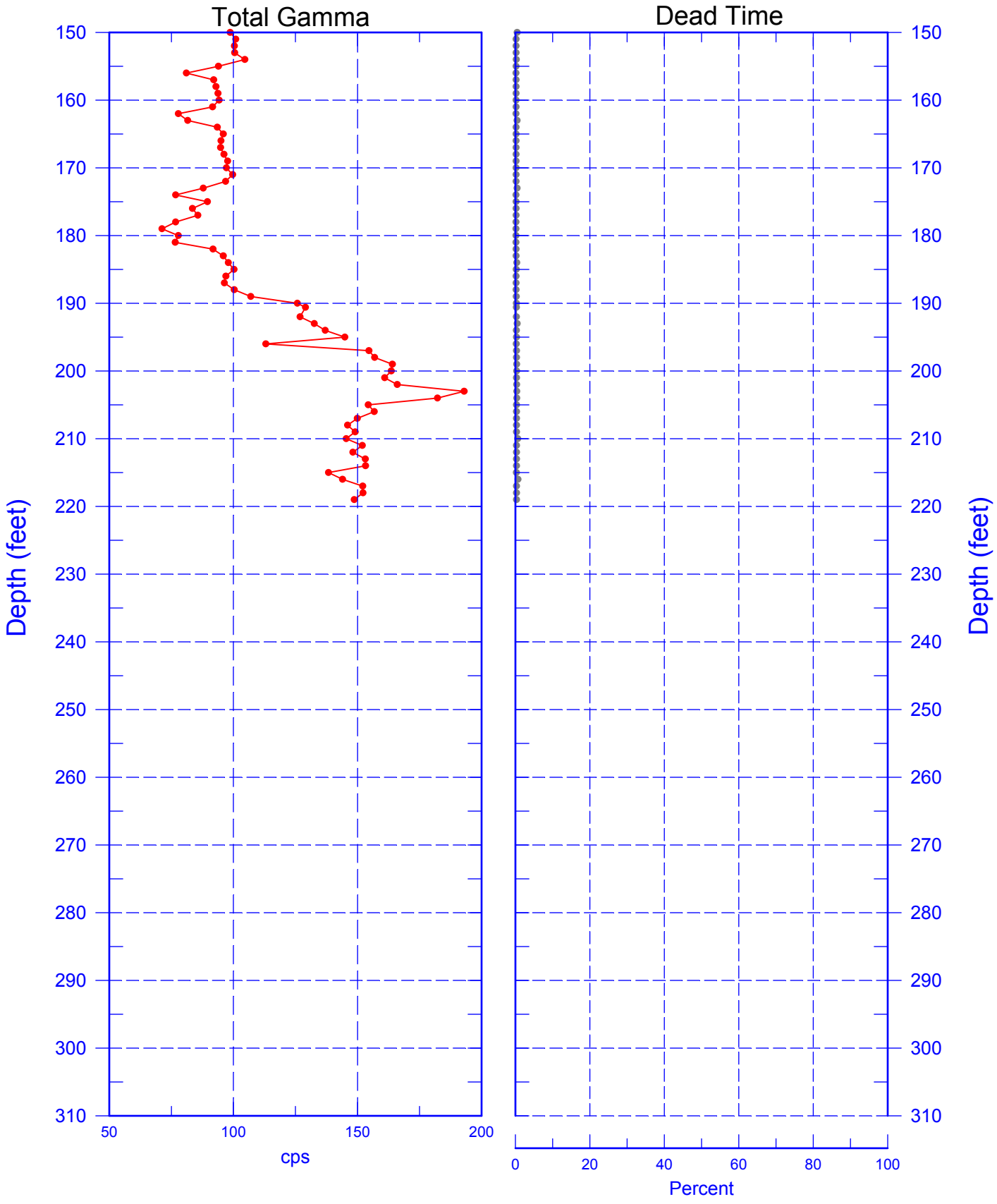



Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Log Date - 05/12/04

# 299-W22-13 (A7838)
# Total Gamma & Dead Time




Reference - Top of Casing

Depth scale: 1" = 20 ft

Last Log Date - 05/12/04

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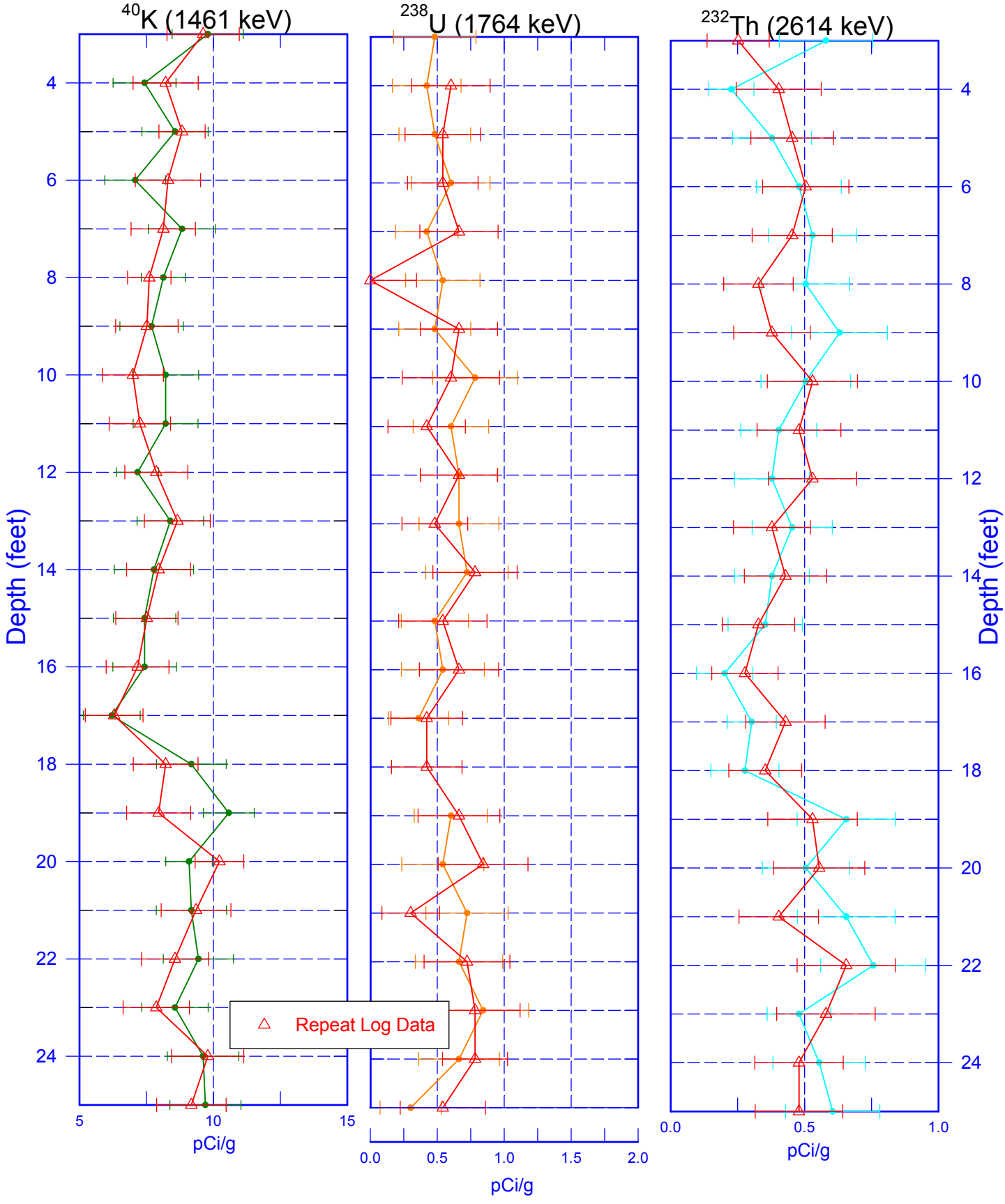
## Repeat Section of Natural Gamma Logs




Zero Reference - Top of Casing

Last Log Date - 05/12/04